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NEWEST TECHNOLOGY AND PRINCIPLES OF CONSTRUCTION MEASURING PARAMETERS CONVERTED RADIO SIGNAL

Issues of accuracy and speed measurement is a key issue of measurement theory and information theory, and from a technical or technological point means one who fully attained the specified improvements, a leader in scientific and technological development and economic (military) power of the country. The proof that this is so, is the creation of quantum measurement theory as an example of measuring the parameters of phase-frequency radio signals (PFRS theory, etc), as well as an example Quantum theory of measuring conversion (QTMC) DAC and ADC, and common to both of them is to use the principle consequence that implements the most powerful of the measurement scales: - scale relations.

Keywords - accuracy and speed measurement, methods of measurement, measuring the parameters of phase-frequency radio signals, Quantum theory of measuring conversion (QTMC) DAC and ADC.

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НОВІТНІ ПРИНЦИПИ ТА ТЕХНОЛОГІЇ ПОБУДОВИ ВИМІРЮВАЛЬНИХ ПЕРЕТВОРЕНЬ ПАРАМЕТРІВ РАДІОСИГНАЛІВ

Питання точності і швидкості вимірювання є ключовим питанням теорії вимірювань і теорії інформації, і з технічної або технологічної точки означає той, хто повністю досягнув зазначені поліпшення, лідер в галузі науково-технічного розвитку та економічної (військової) могутності країни. Доказ того, що це так, це створення квантової теорії вимірювань як приклад вимірювання фазочастотних параметрів радіосигналів (теорія ФЧВ, і т.д.), а також приклад квантової теорії вимірювального перетворення (КТВП) ЦАП і АЦП, і загальні для них обох це використовувати принцип коінціденції, який реалізує найпотужніші із шкал вимірювання: - шкали відношення.

Ключові слова - точність і вимірювання швидкості, методи вимірювання, вимірювання фазочастотних параметрів радіосигналів, Квантова теорія вимірювального перетворення (КТВП) ЦАП і АЦП.

Introduction

The problem of simultaneous measurement and fast in the world based on the classic postulate, which states that while it is impossible to carry out such actions, so their improvement (separately) using the technological capabilities of microelectronics, such as increasing the operating frequency of the element base, reducing the size of the topological elements, etc. so-called extensive road that has already reached the limits of microelectronics facilities submicron range. So the question further increase your specifications requires enormous financial costs and the introduction of new technologies nanoeletronics that are still in their infancy and, at best, give another order of magnitude improvement since switching to subatomic size is unattainable.

It is obvious by the fact that classical methods of measurement clearly marked: the product of the specified parameters are constant, where in practice we either increase the measurement accuracy by increasing the measurement time (speed reduction), or, on the contrary: fast measurements are performed with considerable errors. The main driving element here may be the fundamental assertion that in nature there is no paradox, as all this is, "to put it mildly," failed attempts to explain quite obvious from the standpoint of existing "classical" methods of measurement.We found theoretically and practically proven to specimens layouts devices, by using the principles coincidence was achieved at the same time improving the speed and accuracy and measurement frequency (100-1000 times) [1], the amplitude parameters (10-100 times) [2], without significant complications and even simplify measuring circuits (adaptability).- Manufactured and tested frequency coincidence, measuring frequency converter, phase-frequency synthesizers sequent, attenuator - divider Trotsyshyna [3] used as a layout for laboratory work students. According to the research 1 doctor and 7 PhD theses, published a monograph, more than 50 articles, nearly 150 reports of conferences, 5 patents.

Problem Statement

Any measurement is analog-to- digital conversion - set of measured values are replaced with a selectable digital equivalent. The procedure of converting the continuous physical counts in its digital sampling values is called quantization (level or time), and accompanied by the appearance of quantization errors are divided into methodological (depending on the chosen method of quantization, measurement conversion), and instrumental caused by a resolution of the final practical circuits and circuit elements of real gauges.

For example, the frequency measurement error depends on the measurement time (access to the signal) - methodical, and the errors caused by instability model generators, instability and trigger jitter components - instrumental.

Methodological errors created man who chooses measurement method (sequential account countdown), and creating a systematic error, then heroically struggling with it (interpolation, temporal sampling, etc.). With the instrumental errors can be combated by improving the quality of circuit elements and signals, such as signal/noise, instability, jitter, etc.

The general line of the Quantum theory of measuring conversion (QTMC) [2], it did not create the

methodical error and excluded by the terms of their education.

For frequency consistent accounts, the error arises from the binding time to a time interval (1s), the frequency resolution (methodical error) is 1Hz that no relationship to the measured frequency has not, but get less than 1Hz resolution, within less than 1s – IMPOSSIBLE [1].

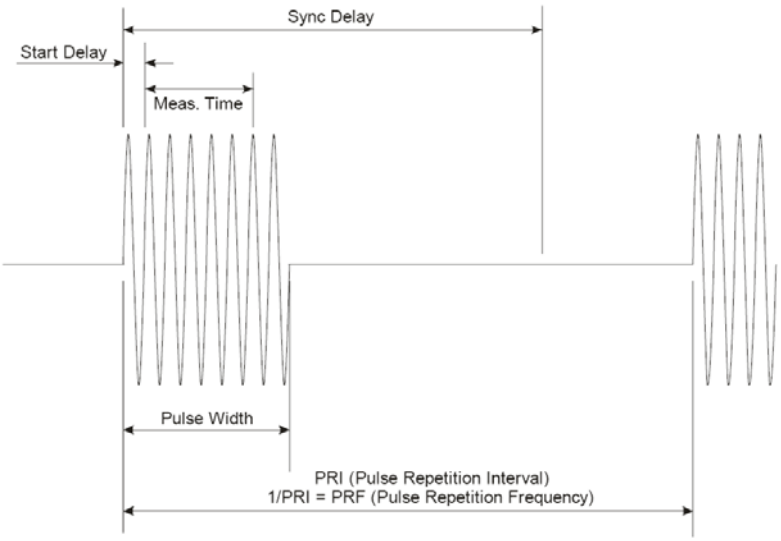

Figure. 1. Typical appearance radiompulsnoho signal

Method countdown has methodical errors, too, in consequence of not only the introduction of the measurement time, but also linking it to the reference frequency (model AS), which leads to the same restrictions!

Within KTIP invited not to create conditions for the emergence of methodical errors caused by establishing a temporary measure, it is to start measuring!

For example, having two signals with different frequencies, you can watch a match front, of similar zero - crossings, which will take place at the difference frequency. Start measurement (pulse counting and measuring the reference frequency) at the first match, and finish at the subsequent (and not through 1s, or other defined time people). The method of this measurement method called coincidence (double coincidence), the scale of measurement conversion is determined by the ratio A/B, where A and B are integers complete phase cycles measured and the reference frequency, no methodical error is not here!

Figure. 2. Photos of measuring the frequency converter

Ratio scale A/V is the most powerful and versatile in the theory of scales, and it can be obtained as a special case - simpler. Therefore, it realizes the achievement of high accuracy and speed of measurement frequencies, compared with other known methods [1].

Moreover, the resolution of the scale relations (coincidence) is determined by the magnitude of the denominator (B), and at values of 1000 gives a scale coincidence with 300 thousand points, and an increase in the binary system can be estimated as in "two to the power two minus two K" - for k = 10 will be $2^{2x10-2} = 2^{18}$, which gives a gain of 300 times, of 1000, which gives 300 thousands point scale.

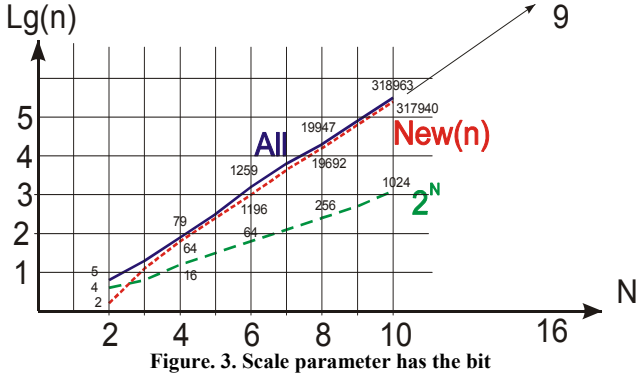

Figure. 3. Scale parameter has the bit

Increasing up to k = 20, the gain will be $2^{2x20-2} = 2^{38-20} = 2^{18}$ bits! Relatively million or about 250 billion

points of the scale, etc.

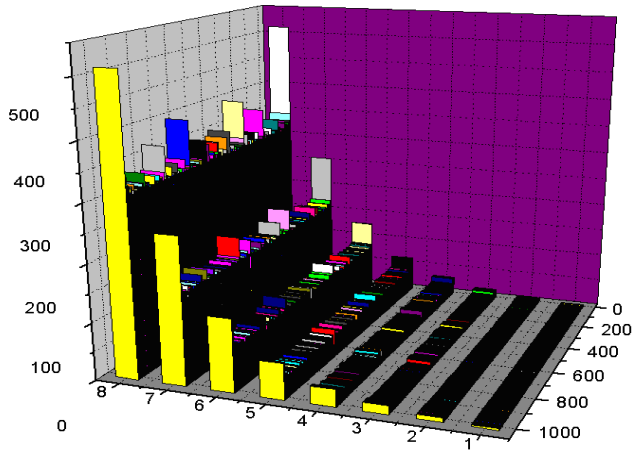

Figure. 4. Three-dimensional scale of parameter depends on the bit

But, "the methodical error method coincidence" significantly less INSTRUMENTAL already at capacity 10000-100000 counters that almost rarely better error 10^{-9} or 10^{-6}.

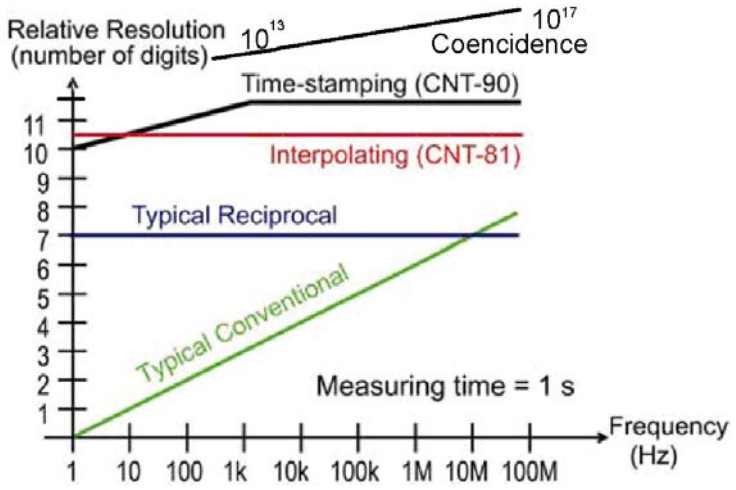

Figure. 5. Hierarchy of methods for measuring

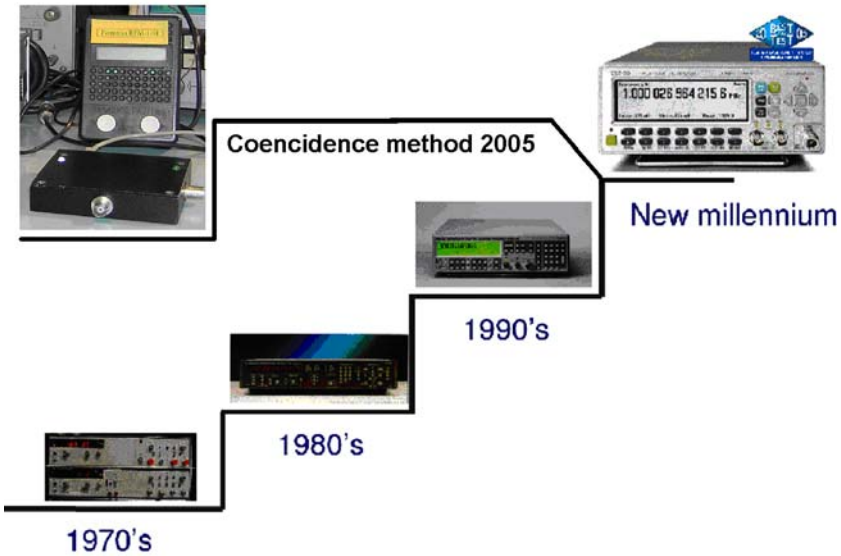

Figure. 6. Hierarchy of instruments for measuring the frequency at the global level

At the same time, measurements, or rather its maximum value depends only on the capacity of the meter (100000) and the value of the reference frequency of 1 GHz), would give a value of 0,1 milliseconds time measurement with resolution lower than Hertz units, in the frequency range 10MHz - 10GHz [1]!

The result value is determined by multiplying the frequency measurements of the fraction A/B on the

reference value, and the number of digits in the result (resolution) is selected from the above-mentioned ratio Quantum dots scale measuring conversion (QDSMC), and the reliability of each of the lower order bits can be evaluated "depth filling counters" which are selected at a level higher frequency resolution.

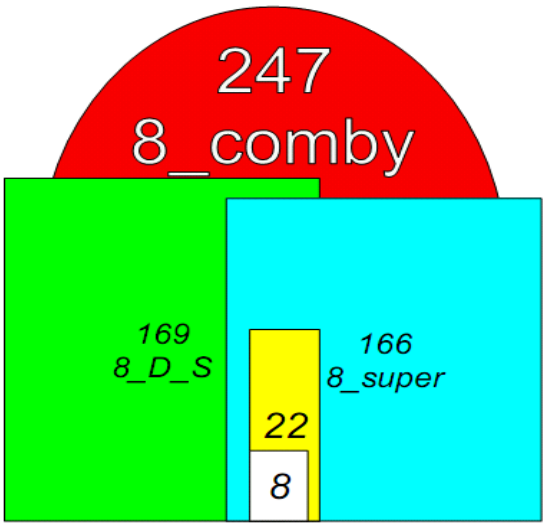

Figure. 7. Hierarchy of scales measuring conversion to DAC and ADC

Conclusion

In the theory of phase-frequency radio measurements and conversions determined that for the real class information signals, which are called radio, classic model definition frequency as the inverse value of the period is inadequate, which leads not only to confusion and fundamental limitations of accuracy and speed of frequency measurement that principle can not be better than 1Hz during the measurement under 1s. Using phase-frequency approach with a model of the primacy of the total phase, and secondary frequency that is a derivative, was able to prove and almost get resolution measurement frequency unit Hz at frequencies of 1-10MHz for the access time of the signal is less than one millisecond, that is 1000 times better than the classical methods . Fundamental here is the use of the principles of measurement based on the method coincidence [1].

Similar results to improve the resolution of the DAC and ADC 10 - 100 times obtained in the framework of quantum theory of measurement conversion by using attenuators - divider Trotsyshyna and its modifications, instead of the classical Kelvin divider [2, 3]. The main element of the principal advocates the use of quantum measurement scale that contains all possible (quantum point scale), whereas classical approaches and models use only a small part of them, such as 8- resistor divider Kelvin number of points = 8, and for couples from attenuator - divider Trotsyshyna number for 8 resistor chain can be (depending on the type of converter) 22 - (coincidence) 166 - (double coincidence) 169 - (total -difference), 247 - (combined) [2].

At present, there are no chips DAC and ADC with programmable and adaptable parameters that gave rise to a huge range of issue (thousands), which must be chosen each time, and setting them to change and adapt their performance transformation is impossible. At the same time adaptive signal processing techniques and programmable IBCs are of great importance and no products equivalent FPGA for digital circuitry inhibits the development of measurement instruments and implementation of innovative digital technologies.

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